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UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

NATIONAL WILDLIFE FED'N, et al., Plaintiffs, v. NATIONAL MARINE FISHERIES SERVICE and UNITED STATES ARMY CORPS OF ENGINEERS, Defendants.	Civ No. 01-00640-RE Declaration of Cynthia A. Henriksen

I, Cynthia A. Henriksen hereby state and declare as follows:

1. I have been employed by the U.S. Army Corps of Engineers (Corps) for approximately thirty years. In November 1995, I became the Chief of the Reservoir Control Center (RCC), Water Management Division, Northwestern Division, U.S. Army Corps of Engineers.

2. I received a Bachelor of Science degree in Civil Engineering from Clemson University, Clemson, South Carolina in 1976, and I have been a registered Professional Engineer in the State of Oregon since 1985.

3. During my thirty years with the Corps of Engineers, I have been involved in numerous water-related activities. During the early years of my career I performed floodplain studies using hydrologic models for the Mobile District of the Corps of Engineers. During the past twenty three years, I have worked in the Water Management Division (WMD) of the Northwestern Division. My responsibilities have included oversight of power planning studies and real-time operations related to power production at Corps multiple use projects in the Columbia, Snake, and Willamette rivers to assure these projects were operated within their design limitations. I have been a member of the Assured Operating Plan (AOP) Team with Canadian and Bonneville Power Administration (BPA) representatives.

4. Since late in 1995, I have been the Chief of the Reservoir Control Center or RCC for the Corps in Portland. The RCC is responsible for water management throughout the Columbia River Basin. This responsibility includes meeting regional needs for flood control, power generation, fish passage, and water quality through river operation. The RCC staff includes fifteen multi-disciplined technical personnel with expertise and skills to respond to these many responsibilities. RCC relies upon expert input from other agencies to help formulate ultimate operational decisions.

5. One of my responsibilities as RCC Chief is to provide instructions to the Corps FCRPS projects and monitor water management operations to ensure, to the extent practicable, that they are consistent with the 2004 Federal Columbia River Power

System (FCRPS) Biological Opinion (BiOp) and the Agreement Regarding 2007 Federal Columbia River Power System Fish Operations (2007 Agreement). One of my duties is to chair the Technical Management Team (TMT). I also oversee the preparation of the reports to the Court pertaining to the fish passage spill and transport operations contained in the 2007 Agreement.

6. The following is a discussion of the Little Goose Dam operations and related downstream operational adjustments that occurred on April 3, 2007. The information contained herein is based on reports and information provided by Corps personnel from Little Goose Dam, the Corps' Walla Walla District, and the RCC.

7. The Corps project operations at Little Goose Dam and other lower Snake River dams are monitored through the Generic Data Acquisition System, or GDACS. This is a system that allows the project operators located on-site, to monitor turbine unit operations and monitor the status of spill gates. GDACS has several large monitor screens in the project control room that display instantaneous settings and discharges from the turbine units and spillways.

8. In addition, the GDACS serves as the interface between the project control room and the Bonneville Power Administration (BPA) dispatchers located in Vancouver, Washington and BPA duty schedulers located in Portland, Oregon. BPA uses the information provided by the GDACS system to remotely send signals to the Corps projects to regulate or adjust project generation loads at operating generating turbines in order for BPA to meet its system load requirements. Based on requests from BPA, the project operators are responsible for turning the turbine units on and off, and for making adjustments in the spill gates to regulate discharge. The GDACS information

is monitored by BPA so they can maintain constant surveillance of the status of the system.

9. The Corps' RCC monitors and reports information at all its FCRPS dams on an hourly basis. The forebay and tailwater elevations reported on the Corps' web page are the data reported from GDACS on the hour. The spill flow and generation flow posted on the web are the average of the GDACS data collected during the preceding hour.

10. Little Goose Dam, as well as the other three lower Snake River projects, is operated consistent with the 2004 FCRPS BiOp and the 2007 Agreement. The operations described in these documents and the Fish Operating Plan, which provides more detailed information on project operations contained in these documents, include lowering the lower Snake River projects to minimum operating pool (MOP) the first of April. At Little Goose Dam, MOP is elevation 633 to 634 mean sea level (msl).

11. The 2007 Agreement calls for 30% spill from Little Goose Dam beginning April 3. Spill quantities for fish passage operations at Little Goose have been identified as 30% of total dam discharge[1] based on adult passage issues that occurred in 2005 under the Court ordered summer spill operations at the Little Goose project. The initial spill levels in the 2005 court order caused eddies in the Little Goose tailrace, which impacted adult fish passage.

12. On April 3, 2007, spill for fish passage was initiated at Little Goose Dam at 12:00 a.m. and reached 30% of instantaneous discharge, or near 15 kcfs spill, shortly after 12:00 a.m. Throughout early to mid morning, the power house control room operator

[1] Total discharge from a project is not necessarily the same volume of water coming into the project from upstream.

monitored the project's performance on the GDACS and carried out changes in turbine operations (turning turbines on or off) in accordance with the BPA scheduler's requests. At approximately 10:30 a.m., the powerhouse control room operator rose from his seat in front of the GDACS monitor and noticed that the forebay water surface elevation displayed on a digital panel on the wall behind him in the control room was reading 632.5 feet, approximately 0.75 feet lower than the 633.25 feet shown on the GDACS monitor, and approximately 0.5 feet below the project's minimum operating level of elevation 633.0 msl. The operator contacted another project employee working at the navigation lock by radio, and asked this employee to check the forebay staff gauge located at the navigation lock. The staff gauge is a panel bolted on the side of the dam with markings in 0.1 feet increments that measure the elevation of the forebay water surface. This gauge was consistent with the digital display panel in the control room indicating the GDACS was not operating correctly and displaying faulty information.

13. Consequently, the project operator then manually inputted the correct forebay level into the GDACS at approximately 10:35 a.m. At 10:52 a.m., the project operator was contacted by the BPA scheduler regarding the forebay being below the minimum operating pool level. To begin returning the project to the appropriate reservoir elevation, the BPA scheduler requested that the project operator decrease the spill discharge and turn off one generating unit, while BPA remotely decreased the project generation level on the remaining operating unit via their signal. At 11:38 a.m., the operator prepared a trouble report on the faulty calibration of the forebay sensor system (Attachment 2).

14. Once BPA became aware that the Little Goose forebay had dropped below normal MOP elevation, the Little Goose total project discharge was reduced from 36.54 kcfs at 10:50 a.m. to begin refilling the pool. The total project discharge was approximately 17.5 kcfs through 4:20 p.m. During this period, the hourly average spill was 30% of the total project discharge (Attachment 1).[2] Project operation changes to bring the reservoir back to the appropriate MOP elevation continued, reaching elevation 633 at approximately 1:10 p.m. (Attachment 1). During the period from 10:00 a.m. through nearly 5:00 p.m., the total project discharge - flow and spill from Little Goose was reduced in order to operate at elevation 633 and restore project discharges to the levels it had been at 10:00 a.m., prior to the equipment failure.

15. By 5:00 p.m., the project was operating within its normal reservoir operating range, and generating with two units while spilling 10.9 kcfs of the total discharge of 35.7 kcfs. The spill that was reduced during this period on April 3, 2007 was approximately 3.2 thousand acre-feet (Kaf).

16. The reduction in Little Goose Dam total discharge, which occurred in order to return the reservoir to elevation 633, had a ripple effect on the two projects directly downstream of Little Goose Dam, i.e. Lower Monumental and Ice Harbor dams. The discharges at these two dams were also adjusted in an attempt to minimize drafts at these reservoirs significantly below their minimum operating pool limits for an extended duration.

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[2] The reported hourly average spill quantity dropped from about 12 kcfs for the hour ending at 10:00 a.m. to 5.5 kcfs for the hour ending 12:00 p.m. The GDACS data included in the Attachments to my Declaration are reports of project status on a five-minute interval. The Corps' RCC receives hourly interval data that is used for reporting to other agencies and the Court, and it is the information that is available on the Corps' web page.

17. At Lower Monumental Dam, total project discharges on April 3 at 12:00 p.m., were 39.79 kcfs - 26.5 kcfs spill and 13.31 kcfs generation flow through one unit, which was slightly above the minimum generation flow. Shortly after 12:00 p.m., the Lower Monumental forebay dropped approximately 0.25 feet below 537.0 msl (MOP) to elevation 536.74 msl, and then slowly began increasing (Attachment 3). Spill was reduced to 19.76 kcfs at 12:05 p.m. for approximately 15 minutes, and then reduced to zero, while generation on the one operating unit was reduced to minimum generation. From just after 12:20 p.m., the project discharged approximately 11.3 kcfs through one turbine unit (minimum generation) and zero spill flow until 1:15 p.m., at which time the reservoir elevation reached elevation 537.1 feet and spill was resumed.

18. From 1:15 until 2:05 p.m., project spill was maintained at between 10.29 kcfs and 14.75 kcfs, and then slowly reduced to zero at 3:00 p.m. as the forebay elevation dropped again to 539.94 feet. During this period, the generation remained at minimum - approximately 11.4 kcfs. At 3:15 p.m., spill resumed at low levels until 5:35 p.m. when spill levels were increased to approximately 26 kcfs. Throughout the afternoon, minimum generation (approximately 11.5 kcfs) continued. The reduction in spill volume from 12:00 p.m. to 6:00 p.m. at Lower Monumental Dam was approximately 9.1 Kaf.

19. Ice Harbor Dam, the next downstream project, was spilling approximately 45 kcfs on April 3. Because of the upstream adjustments made in operations as a result of the equipment malfunction at Little Goose Dam, the Ice Harbor Dam operations were also modified as this reservoir dropped below MOP, elevation 437 feet. At 12:30

p.m., Ice Harbor Dam was operating one turbine. Spill was reduced to approximately 25 kcfs until 1:35 p.m., at which time it slowly transitioned to zero spill discharge over a 20 minute period. (Attachment 4). Minimum project discharge was maintained through generation of one turbine unit at approximately 9.2 kcfs through approximately 5:35 p.m., with the exception of about 15 minutes at 4:00 p.m. when the RSW was operated with 8 kcfs. During this time, the pool dropped below its normal minimum operating level of 437 feet for short durations. The project operated the RSW and minimum generation at one turbine unit at approximately 9.2 kcfs from 5:40 p.m. until 7:40 p.m. when spill was slowly increased to approximately 28 kcfs and again increased to about 38 kcfs at 8:25 p.m. During the period from 12:00 p.m. to about 8:00 p.m., in response to the upstream conditions and to minimize reductions in the pool elevation and maintain minimum generation, the approximate reduction in spill volume at Ice Harbor Dam was approximately 6.7 Kaf.

20. The overall reduction in spill in the lower Snake River associated with the equipment failure in the GDACS forebay monitor system at Little Goose Dam during the afternoon of April 3, was approximately 19 Kaf.

Background on Operations for ESA Listed Fish at the Lower Snake River Projects

21. The four lower Snake River projects have specific operating reservoir ranges, i.e. minimum to full pool elevations. Project facilities were designed and constructed to operate correctly within these ranges.[3] Such facilities include the adult fish passage facilities, juvenile fish bypass systems, and navigation locks – all of which are

[3] Ice Harbor and Lower Monumental dams have 3 foot operating ranges, and Little Goose and Lower Granite dams have 5 foot operating ranges. For the juvenile fish passage season, the reservoirs all operate in the lower 1 foot of the operating ranges, or MOP.

designed to operate at MOP and above. Therefore, when it was discovered that the Little Goose pool was below MOP the morning of April 3, adjustments were necessary such that the project facilities, including those for fish passage, could operate within criteria and minimize or avoid additional problems that could affect fish or safe navigation.

22. For example, the upstream end, or water control section of the adult fish ladder at Little Goose Dam, is designed to operate with water coming through the ladder exit from the forebay. At maximum reservoir elevation or full pool, the ladder exit pool is 11 feet deep, whereas at MOP elevation, it is 6 feet deep. This section of the ladder is designed to adjust to the fluctuations in the water that comes into the ladder with the 5 foot forebay variation, allowing adult fish to pass through safely. At the lower end of the water control section of the ladder is a water "add-in" diffuser, which provides additional water to maintain 75 cfs in the main fish ladder. This diffuser automatically makes water adjustments as the forebay goes from maximum operating pool to minimum operating pool, maintaining the hydraulic conditions of the ladder downstream of the diffuser.

23. When the reservoir drops below MOP, it decreases the amount of water entering the ladder through the ladder exit, providing less depth at the exit for fish to move into the reservoir, and may impact the ability of the add-in diffuser to provide sufficient water to meet the hydraulic conditions needed for proper functioning of the ladder.

24. The juvenile bypass system at Little Goose Dam was designed to operate within this 5 foot range. The gatewell orifices are at a set elevation providing optimum flows to attract juvenile fish from the gatewells into the juvenile bypass system. When the

reservoir drops below MOP, the amount of water passing through the orifices decreases, and the efficiency of the orifices to pass juvenile fish is also decreased. Flows through the orifices at Little Goose Dam range from approximately 15.2 cfs at full pool to 9.8 cfs at MOP. Optimum flows are 11 cfs or greater.

25. In addition, the navigation locks on the lower Snake River are designed to provide 15 feet of depth over the concrete exit sills on the upstream side of the locks.[4] These depths are required for safe passage of tows into and out of the locks to provide sufficient clearance to ensure the tows do not hit the concrete sills or the top of the upstream lock gates.

Impacts to ESA Listed Fish Associated with April 3 Spill Reductions

26. The operating season for juvenile fish passage facilities at the lower Snake River projects begin on March 25 at Lower Granite Dam, and April 1 at the remaining downstream lower Snake River projects - Little Goose, Lower Monumental, and Ice Harbor dams. Passage time for early season migrating juvenile fish from Lower Granite Dam to Little Goose Dam takes up to 8 days.[5] Passage from Little Goose to Lower Monumental takes another 3 days. The following discussion is based upon information provided to me by Corps biologists.

27. Bypassing juvenile fish past Lower Granite Dam began on March 25, 2007 along with daily sampling of juvenile fish for the BPA funded Smolt Monitoring Program (SMP). The SMP is a fishery agency program for sampling fish at various dams and other locations throughout the region for monitoring status of migrations. The SMP

[4] Snake River projects have an authorized navigation channel depth of 14 feet.
[5] Because arrival of juvenile fish at the dams differs, the 2007 Agreement includes the 8 day staggered start of the juvenile fish transportation program.

is overseen by the Fish Passage Center (FPC), which extrapolates daily sampling information at Lower Granite Dam to develop daily passage indices for the project. While the passage indices are not intended to be absolute estimates of daily juvenile passage, they provide projections for the number of fish passing projects during the juvenile passage season.

28. From March 25 through April 2, the fish passage indices provided by the FPC estimated that Lower Granite daily passage ranged from a low of 385 fish on March 25 to a high of 1,470 on April 1. A total of 8,807 were estimated to have passed Lower Granite Dam through April 2. Based on the estimated migration timing (incorporated into the 2007 Agreement), daily passage numbers of juvenile fish at Little Goose on April 3 would be at the lower end of this range, with Lower Monumental in the same or lower range. These daily passage indices are reflective of the very beginning of the juvenile migration season when compared to previous years' passage indices ranging from several hundred thousand to almost a million fish per day during the peak of the migrations in late April to mid - May.

29. As noted above, operating below MOP has implications for both adult and juvenile fish passage. When the reservoir elevation is below MOP, the orifice flow in the juvenile bypass system is reduced, which may delay juvenile fish entering the bypass system. Adult fish may be delayed due to reduced flow in the adult ladder systems as well.

30. While spill reductions or short periods of no spill may have delayed migrating juvenile fish for short time periods on April 3, because of the problems noted in paragraph 27, it is important to return the adult and juvenile facilities back to normal

operation as soon as possible. The actual impact to migrating juvenile fish with reduced or no spill is difficult to estimate due to the very small numbers of fish present on April 3.

31. It is anticipated that under the conditions that occurred on April 3, juvenile fish may have been delayed in their migration for a few hours, or proceeded through the bypass systems with high survival rates, or passed through turbines at a reduced survival rate as compared to either bypass or spill. However, based on the low fish passage index on April 3, and the short duration of this operation, the overall impact to juvenile fish while returning the reservoir back to MOP elevations, was likely minimal.

32. It is important to note that non-spill passage routes were available on April 3. Information on relative survival estimates for juvenile spring Chinook using available passage routes under normal operating conditions are noted in the table below. While these estimates are based on information gathered under normal operating conditions, they are useful in understanding the relative differences in survival that may have occurred on April 3.

Little Goose	Little Goose Survival %	Lower Monumental Survival %	Ice Harbor Survival %
Spillway	97.2	96.1	96.5
Turbine	92.3	88.1	87.1
Bypass	96.4	92.2	99.7

33. Given there are differences in flow at elevations below MOP as compared to MOP or greater, it is difficult to provide definitive information as to whether the fish were delayed or what the actual survival numbers were when using the other available

means of passage routes. If fish were delayed, they would not likely have any change in survival. The juvenile fish that were destined for the spillway and passed through either the bypass or through turbines would have approximately a 1-5% reduction in survival at Little Goose, approximately a 4-8% change at Lower Monumental, and approximately 0-9% change at Ice Harbor.

Conclusion

34. The equipment error at Little Goose resulted in a short-term disruption of operations overall, with potential impact to fish that is difficult to quantify. The Corps will closely monitor operations to minimize future occurrences. Personnel at Little Goose Dam have determined that erroneous forebay elevation data was transmitted to GDACS as the result of a faulty circuit board card. This card is obsolete and cannot be replaced. Therefore, to automate the forebay elevation readings in GDACS again, project personnel will calibrate the Unit 1forebay radar sensor reading to send the data directly to GDACS. Personnel at Little Goose Dam will reprogram and calibrate the system by May 11, 2007. Until the calibration is complete, the project personnel are using the back-up digital display panel to read the pool elevation and manually enter the data into the GDACS approximately three times per hour.
35. The Corps and BPA have established a weekly review of fish operations in order to ensure that any deviations from the Fish Operations Plan or the 2004 BiOp are identified and remedied as quickly as possible.

36. I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this 1st day of May, 2007, in Portland, Oregon.

Cynthia A. Henriksen
Northwestern Division
U.S. Army Corps of Engineers